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FURTHER STUDIES OF CLUSTERS OF GALAXIES USING ROSAT ALL-SKY SURVEY DATA

J. Patrick Henry, PI

This grant has been the main funding source for the PI's research with ROSAT. It is been augmented through the years to include pointed observations in addition to the All-Sky Survey work. In general, the research conducted under this grant has been very successful.

All-Sky Survey

The PI is one of only a handful of US investigators with access to the ROSAT All-Sky Survey data. He has concentrated on identifying the approximately 600 faint X-ray sources near the North Ecliptic Pole (NEP) where the survey is the deepest. The sources were acquired by a manual analysis of the survey in 1991. It is only within the past six months that this analysis has been superseded by the production analysis. Approximately two-thirds of the original 600 sources have been identified, with the usual mix of galactic and extragalactic sources noted from previous surveys. The rapid evolution of the cluster X-ray luminosity discovered in the Einstein Medium Sensitivity Survey has been confirmed. A very distant cluster, with a redshift of 0.81, has also been discovered. This cluster is one of the most distant clusters known. Work for the future will now shift to the production data. Fortunately the sources from that analysis are nearly identical to those from the original manual analysis.

Pointed Observations

This work has concentrated on the description of substructure in nearby clusters from PSPC observations. It has included the definitive proof that the Coma cluster is not virialized. This cluster was the prototype of a rich relaxed cluster. Previous work had hinted that it had not yet virialized but the discovery of a group merging with the cluster sealed the argument. The first fully two dimensional temperature maps of clusters of galaxies have also been produced. These maps demonstrate that temperature structure is an extremely good way to elucidate the dynamical state of a cluster. For example, the temperature map of the Coma cluster shows that the merging group has passed through the cluster already, contrary to the initial interpretation of the data. Although these temperature maps can only be made for a few massive clusters with the PSPC, they are the first and they will help to understand the maps from ASCA which has different systematic effects. Future work will concentrate on measuring the structure of a sample of distant clusters using HRI observations.

Over twenty papers have been published in refereed journals or as invited review talks as a result of the research funded by this grant.